

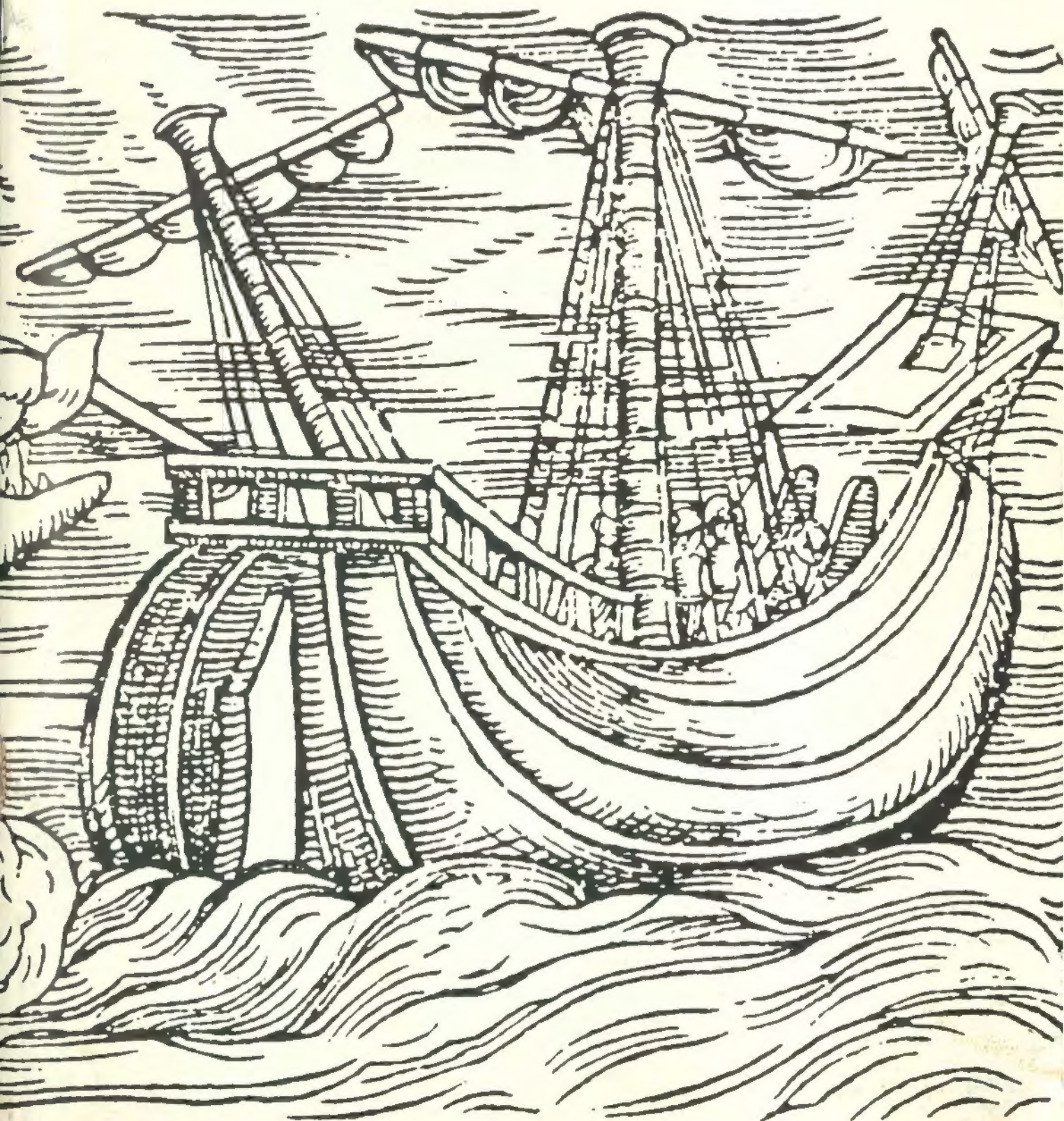
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Architeuthis—The Giant Squid: A True Explanation for Some Sea Serpents

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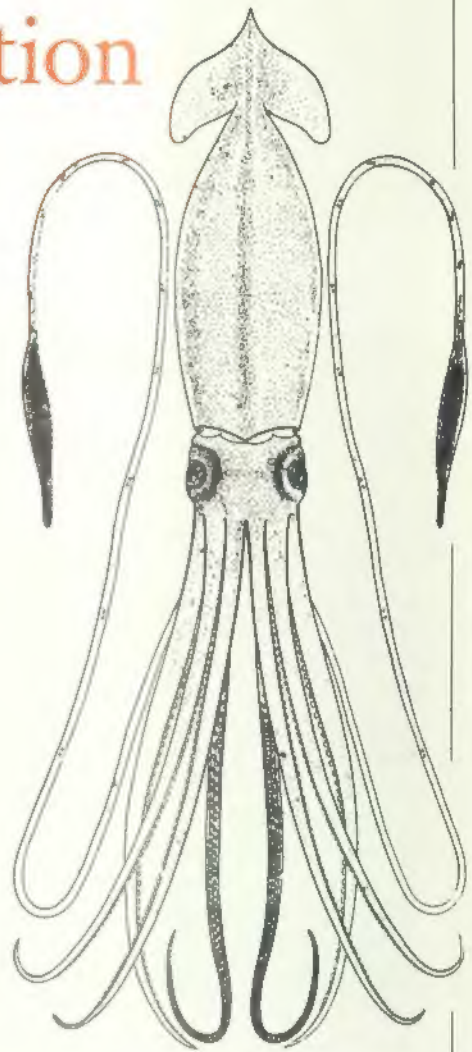
At sea off the Cape of Good Hope.... In the distance, a large dark shape is seen; it is obviously some sort of animal. The crew gathers on deck to get a better look. Sailing closer, we can make out a cylindrical body, moving effortlessly through the water. It is dark brown or black, glistening wetly. A snake-like neck appears, with a flattened head, weaving from side to side like a gigantic cobra. We can see no mouth or eyes, but that may be because the animal is facing away from us. Even though we cannot see its tail, we estimate its total length at about fifty feet. What can it be? A sea serpent? Some sort of seagoing dinosaur from prehistoric times?

Sea serpents of one sort or another have appeared throughout the world's oceans, and among the first descriptions was that of Olaus Magnus (1490-1557), the Catholic Archbishop of Sweden. He was influential as a cleric and historian, but his name will be forever associated with sea monsters. In 1658 he wrote *A Compendious History of the Goths, Swedes & Vandals, and other Northern Nations*. The descriptions and drawings that appeared on his maps firmly established the existence of many fabulous creatures, and were copied, reproduced, and modified for centuries, thus assuring his place as one of the most important figures in the history of zoology. He described the *Soe Orm* as follows: "A very large Sea-Serpent of a length upwards of 200 feet and 20 feet in diameter which lives in rocks and in holes near the shore of Bergen; it comes out of its cavern only on summer nights and in fine weather to destroy calves, lambs, or hogs, or goes into the sea to eat cuttles, lobster, and all kinds of sea crabs. It has a growth of hairs of two feet in length hanging from the neck, sharp scales of a dark brown color, and brilliant flaming eyes."

The Danish missionary Hans Egede, who eventually became the Bishop of Greenland, visited that ice island early in the eighteenth century, in hopes of converting the natives to Christianity. Two settlements were established, the first in 1721 and the second in 1723. While the Greenland Eskimos proved to be unsusceptible to the faith that was being pressed upon them, they were disastrously susceptible to the smallpox virus carried by one of the Danish missionaries, and most of them died. Egede's story is told in his *Det gamle Gronlands nye Perustration* (published in 1741), which contains the following description:

The Monster was of so huge a Size, that coming out of the Water its Head reached as high, as the Mast-Head; its Body was as bulky as the Ship, and three or four times as long. It had a long pointed Snout, and spouted like a Whale-Fish; great broad Paws, and the body seemed covered with shell-work, its skin very rugged and uneven. The under Part of its Body was shaped like an enormous huge Serpent, and when it dived again under Water, it plunged backwards into the Sea and so raised its Tail aloft, which seemed a whole Ship's Length distant from the bulkiest part of its body.

Clergymen seemed to have a particular affinity for sea monsters (or perhaps it was vice versa), for our next witness is Bishop Erik Ludvigsen Pontoppidan of Bergen, author of *The Natural History of Norway*, published in 1755. The good bishop firmly believed in the kraken, which he called "Kraken, Kraxen, or, as some name it, Krabben," and maintained that the fishermen he spoke to told him it was a mile and a half in circumference. He took the deposition of a certain Captain von Ferry, who claimed to have seen a "sea-snake" passing his ship in August 1746. Upon being informed of the presence of the serpent, von Ferry



A.E. Ferrill's diagram of an Architeuthis shows clearly the long, streamlined mantle that surrounds the body, the pair of arrow-like fins on the "tail" (which leads as the creature propels itself backwards through the water), the very large eyes, the ring of eight arms that surround the mouth, and the two long tentacles that grasp its prey. (U.S. Fish Commission, Report...for 1879)

came about in order to get nearer to it. At the Bishop's request, he described it in a letter written to the Court of Justice at Bergen:

The head of this sea-serpent, which it held more than two feet above the water, resembled that of a horse. It was of a greyish color, and the mouth was quite black and very large. It had large black eyes, and a long white mane, which hung down to the surface

of the water. Besides the head and neck, we saw seven or eight folds, or coils, of this snake, which were very thick, and as far as we could tell, there was a fathom's distance between each fold.

Another worthy included in the Bishop's *Natural History* was Governor Benstrup, who saw quite a different monster than Captain von Ferry. Benstrup's version, which he illustrated, shows a long, snake-like creature, with several bends in its body showing above the surface, which he likened to "a string of buoys." The two sea-serpents included in Bishop Pontoppidan's discussion seem to have nothing in common except the folds, but in his *In the Wake of the Sea Serpents*, Bernard Heuvelmans is ready to believe in both of them: "Thus we see that in the middle of the eighteenth century at least two large sea-monsters, both partly serpentiform, but certainly different in anatomy, were found in northern waters and were rivals for the title of great sea-serpent."

Even sightings that occur in the same area seem to happen in sequence, often within a couple of years of each other. Soon after the furor of the Norwegian monsters had subsided, an Englishman named Charles (later Captain) Douglas,

sailing off Lapland in HMS *Emerald*, on one of the first European oceanographic voyages, interrogated the Norwegians about the kraken and the sea-serpent, and while no one could tell him anything about the kraken, they knew a lot about what they called "Stoor Worms." Douglas recounted one sighting, described by the master of a Norwegian vessel, of three of the worms, "floating upon the surface of the sea, twelve parts of the back of the largest appearing above water; each part being in length about six feet...so that upon the whole he judged the animal could not be less than twenty-five fathoms long, and about one in thickness." From Douglas's description (which was read to the Royal Society in 1770), the "worms" might very well be the arms of a giant squid, either dead or dying.

Incredibly, the *real* kraken did not reveal itself to science until 1853, when a Danish zoologist named Johann Japetus Steenstrup examined a six-inch beak. (Giant squid have beaks like parrots, only considerably larger.) In November 1861 the French navy dispatch steamer *Alecton* had an encounter as it approached Teneriffe. "Finding myself in the presence of one of these strange beings that the ocean sometimes

produces from its depths as if to offer defiance to science, I resolved to study nearer by, and try to gain possession of it," reported Lieutenant Bouyer, the *Alecton's* commander (whom A.E. Verrill later quoted). "It is the giant squid, but the form of the tail seems to make it of undescribed variety. It seemed to measure 15-18 feet to the head, shaped like a parrot's beak, and enveloped by 8 arms, from 5 to 6 feet long. Its appearance was frightful, its color a brick-red, and this half-formed being, this colossal and slimy embryo, has a repulsive and terrible appearance."

The *Alecton's* monster escaped, and it would be another twelve years before a scientist would actually examine the body of *Architeuthis*. For reasons that will probably go forever unexplained, giant squid began appearing off Newfoundland during the decade 1870-80, when as many as 60 of these beasts, some of them

In 1734, Hans Egede, the Bishop of Greenland, reported this web-footed monster. Despite its somewhat improbable position, it is possible to see the giant squid Architeuthis as a likely explanation. (Harper's New Monthly Magazine, July 1860)



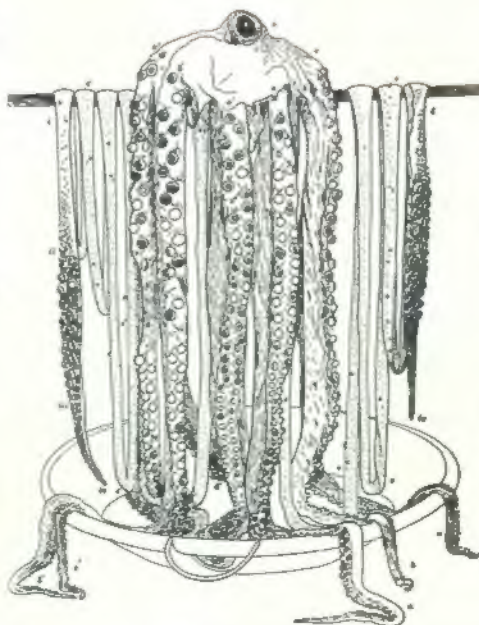
over 40 feet long, were found on the beach or floating offshore. The Gloucester fishing schooner *B.D. Haskins* picked up the first reported one on the Grand Banks in October 1871. After judging it to weigh about a ton, with a 15-foot body and 9-10-foot arms, the crew used most of it for bait. Science's first specimen was collected by the Rev. Moses Harvey of St. John's, Newfoundland—a 7-foot carcass with 6-foot arms and 24-foot tentacles, which became entangled in a herring net at Logie Bay in 1873. Two years later, as many as 30 dead and dying specimens provided a bonanza of bait for American fishing schooners on the Grand Banks. All of these sightings and recoveries led Yale University's A.E. Verrill to provide the first detailed analysis of the type—the largest of which he christened *Architeuthis princeps*—in the U.S. Fish Commission's annual report for 1879. Then, almost as quickly as they had appeared, the giant creatures disappeared from Newfoundland waters, but next they began to turn up in New Zealand. Since the turn of the century, *Architeuthis* carcasses have shown up in what appear to be random locations around the world, from Iceland and Norway to South Africa and Cape Cod.

From the most sporadic and circumstantial of evidence, we believe they live at great depths. But from an examination of the carcasses, we can extrapolate something about their lives in the icy blackness. First there are the eyes: the giant squid has the largest eyes in the animal kingdom, which can reach a diameter of 15 inches—the size of an automobile hubcap. And they are highly-developed eyes, as complex and capable as those of the higher vertebrates, but adapted for seeing in very low light levels—and of course underwater, as well. Like all squid, *Architeuthis* has eight arms and two greatly elongated tentacles, which may reach a length of 40 feet. The two tentacles are equipped with "clubs," which can grasp and hold the prey items, whatever they might be. The other eight arms have rows of suckers, each of which is individually movable and has a toothed ring around the perimeter that digs into the flesh of its prey, holding on for eternity or death, whichever comes first. At the center of the corona of arms is the powerful beak, capable of ripping chunks of flesh from prey animals that might be as big as a sperm whale. Giant squid are believed to be solitary hunters.

The giant squid has been celebrated in literature and cinema (it appears in *Moby-Dick* and *Twenty Thousand Leagues Under the Sea*), but despite these appearances—or perhaps because of them—many people still do not believe that such a creature actually exists. Several attempts have been made to replicate the squid in film, but because it is such a complex animal, the attempts have not been totally successful. (In the 1954 Walt Disney production of *Twenty Thousand Leagues Under the Sea*, it took 50 men to operate the wires, hydraulic apparatus, and remote controls required to animate the life-sized, two-ton model.)

While scientists were debating the existence of the kraken, another group of men knew that there was certainly something that fit the early descriptions, and in fact, many of them had actually seen it. Yankee sperm whalers, plying the world's oceans in pursuit of the cachalot, often saw their prey, in its death throes,

The Rev. Moses Harvey draped the complete 1873 Logie Bay Architeuthis specimen over his shower bath to display its form. In this perspective the body is inverted and hidden by the arms, with only the mouth and beak showing at the top. The eight arms, with their many suckers, are 6 feet long; the two 24-foot tentacles, with suckers on the "clubs" at the end, are looped over the crossbar in this engraving from a photograph. (U.S. Fish Commission, Report...for 1879)



regurgitate large pieces of *something*, and they sometimes hooked one of the pieces to get a closer look at it. In 1856, Charles Nordhoff wrote a book called *Whaling and Fishing*, in which he described what the whalers called "squid," but which he believed to be "a monster species of cuttle fish:"

The animal seldom exhibits itself to man; but pieces of the feelers are often seen afloat, on good whaling ground. I have examined such from the boats, and found them to consist of a dirty yellow surface, beneath which appeared a slimy, jelly-like flesh. Of several pieces which we fell in with at various times when in the boats, most had on them portions of the "sucker," or air exchanger with which the common cuttle-fish is furnished, to enable him to hold the prey about which he has slung his snake-like arms. These floating pieces are supposed to have been bitten off or torn by the whales, while feeding on the bottom. Many of those we saw were the circumference of a flour barrel. If this be the size of the arms, of which they probably have hundreds, each furnished with air exhausters the size of a dinner plate, what must be the magnitude of a body which supports such an array?

There are those who believe that *Architeuthis* is a sluggish animal, neither powerful nor aggressive, but suppositions like that are never going to interfere with the creature's enduring reputation as a man-eating, ship-grabbing, whale-wrestling monster. It has long been a part of sperm whale lore that it has to dive to prodigious depths to seek out its favorite prey. The size and alleged ferocity of *Architeuthis* provides more than enough ammunition for the creative writer or over-imaginative naturalist, and titanic battles between the squid and its (perhaps apocryphal) arch-enemy, the sperm whale, will continue to appear in popular literature.

Sperm whales are known to feed on cephalopods, and because these whales have been hunted commercially for almost three centuries, we have had more than ample opportunity to examine the stomach contents. (In the early days of the fishery, however, when the blubber was stripped off alongside the ship, the carcass, along with the stomach contents, was discarded. It was only when the whales were hauled up on the decks of the great factory ships that the stomach contents were spilled out on deck). But even before the days of



mechanized whaling, whalers observed their quarry, in its death throes, vomiting up great hunks of what could only have been giant squid.

In *Moby-Dick*, a giant squid is sighted from the *Pequod*, and described as "A vast pulpy mass, furlongs in length and breadth, of a glancing cream color...innumerable long arms radiating from its centre, and curling and twisting like a nest of anacondas." Like Melville, Frank Bullen was a whaler-turned-author, and in his *The Cruise of the Cachalot*, he described a clash between a squid and a whale. (Bullen's narrative is replete with improbably theatrical episodes of courage—usually his—and wildly unlikely behavior on the part of various animals, and most historians are inclined to dismiss his book as more fiction than fact). Even though it might be pure invention, the book does contain a vivid description of a battle between the two gigantic predators:

A very large sperm whale was locked in deadly conflict with a cuttle-fish, or squid, almost as large as himself, whose interminable tentacles seemed to enlase the whole of his great body. The head of the whale especially seemed a perfect net-work of writhing arms—naturally, I suppose, for it appeared as if the whale had the tail part of the mollusc in his jaws, and, in a business-like, methodical way, was sawing through it. By the side of the black columnar head of the whale appeared the head of the great squid,

as awful an object as one could well imagine even in a fevered dream. Judging as carefully as possible, I estimated it to be at least as large as one of our pipes, which contained three hundred and fifty gallons; but it may have been, and probably was, a good deal larger. The eyes were very remarkable from their size and blackness, which, contrasted with the lroid whiteness of the head, made their appearance all the more striking. They were, at least, a foot in diameter, and seen under such conditions, looked decidedly eerie and hobgoblin-like.

There seems to be no question that the crew and officers of the bark *Pauline* saw a battle between a sperm whale and something on 8 July 1875. As later reported in the *Illustrated London News*, Captain George Drevar was some 20 miles off Cape San Roque, Brazil, when the *Pauline* came upon three very large sperm whales, "and one of them was gripped round the body, with two turns, by what appeared to be a huge serpent. Its back was of a darkish brown and its belly white, with an immense head and mouth, the latter always open." The crew judged it to be 30 feet long, and almost nine in girth. "Using its extremities as levers, the serpent whirled its victim round and round for about fifteen minutes, and then suddenly dragged the whale down." Five days later the *Pauline* passed near a similar huge creature, "shooting itself along the surface," with at least 40 feet showing, and later appearing to stand at least 60 feet out of

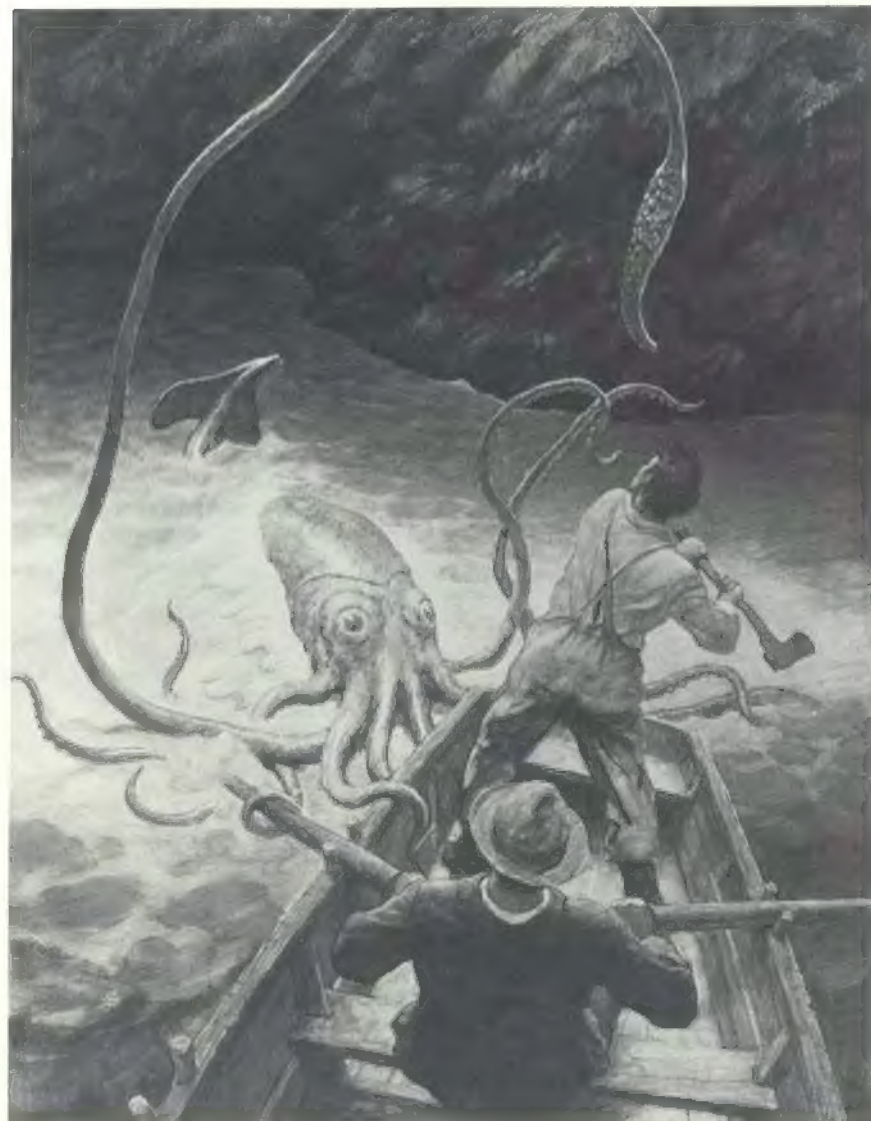
A 30-foot juvenile Architeuthis washed ashore on Plum Island, Massachusetts, in February 1980. In this view the 5-foot body lies on a stretcher. Note the large eye. This specimen is currently on exhibit at the Smithsonian Institution in Washington, D.C. (Photo by Carla Skinder, New England Aquarium)

the water. With the exception of the open mouth, these creatures sound suspiciously like giant squid.

The *Plumper's* sea-serpent was reported in the *Illustrated London News* for 14 April 1849, but the actual sighting occurred at the end of 1848. The article, which was signed "A Naval Officer," included this description:

being due west of Oporto [Portugal] I saw a long black creature with a sharp head, moving slowly, I should think about two knots, through the water in a north westerly direction, there being a fresh breeze at the time, and some sea on. I could not ascertain its exact length, but its back was about twenty feet if not more above the water; and its head, as near as I could judge, from six to eight...the creature moved across our wake towards a merchant ship barque on our lee quarter, and on the port tack.

Also in 1848, the British frigate *Daedalus* was sailing off the Cape of Good Hope when the crew spotted an enormous serpent-like creature, which appeared to



be about 16 inches thick and more than 60 feet long. Its "head" was held about four feet above the water, and its means of propulsion was unclear. Captain Peter M'Quhae reported to the Admiralty, "It had no fins, but something like the mane of a horse, or rather a bunch of seaweed, washed about its back." *The Illustrated London News* ran the story, accompanied by drawings done from M'Quhae's description, and the *Daedalus* monster entered the lists as one of the best-described sea serpents of all time (see *The Log*, 44:3, winter 1992).

With a dark "body," pointed head, no mouth, and only the faintest suggestion of an eye, the illustration that accompanied the description of the *Plumper's* sighting looks like no living creature—except possibly a giant squid. If we look at the drawing of the *Daedalus* monster with *Architeuthis* in mind, the identification of the "monster" leaps off the page.

N.C. Wyeth painted a fanciful but threatening Architeuthis in his Adventure of the Giant Squid of Chain Tickle, ca. 1940, an illustration for an anthology of children's literature. (Courtesy Free Library of Philadelphia)

We see not an "enormous serpent," but rather the tail of an enormous cephalopod. Captain M'Quhae obligingly drew an eye where he thought it ought to go, but in his description he never mentioned it. He did, however, write that "no portion [of its anatomy] was used in propelling it through the water, either by horizontal or vertical undulation." No vertebrate can move through the water without some visible means of propulsion, but a squid, which uses water ejected from the funnel or the mantle to move, could easily conform to M'Quhae's description. Then there is the

case of the *Pauline's* "serpent," coiled twice around a sperm whale and spinning it with its extremities. Since we already know that sperm whales regularly engage in battles with giant squid, it does not require a leap of imagination to see this creature as none other than *Architeuthis*.

While the identity of the *Daedalus's* "prehistoric saurian" remained unresolved, more monsters began to appear, and, because M'Quhae's had been encountered off South Africa, sightings were no longer restricted to the North Atlantic. Not surprisingly then, in 1849, a "large marine mammal, with the head and general figure of an alligator, except that the neck was much longer, and instead of legs the creature had four large flappers," appeared to George Hope, an officer on HMS *Fly* in the Gulf of California. In his discussion of this event (in the British journal *Zoologist*), Edward Newman wrote, "the present existence of huge marine mammals closely related to the Enaliosauri of by-gone ages...appears to me the most interesting Natural History fact of the present century, completely overturning as it does some of the most favourite and fashionable hypotheses of geological science."

I do not propose to assign all sea-serpent sightings to *Architeuthis*, but there is a strong possibility that many of those seamen and passengers who reported a "monster" of some sort were actually seeing the giant squid. Let us examine the serpents of the Scandinavian ecclesiastics, Bishops Egede and Pontoppidan. As Henry Lee points out in *Sea Monsters Unmasked*, Egede's illustration of a sea serpent can be easily made to look like a giant squid if we eliminate the eye and the mouth, and have the "blow" come from the funnel instead of from the mouth.

Pontoppidan's accounts are based largely on hearsay and the reports of Von Ferry and Benstrup, but he also mentions the carcasses that washed ashore with regularity on the coasts of Norway. Is it not possible that mid-eighteenth-century Norway saw an invasion of giant squid like the one that occurred in Newfoundland in the late nineteenth century?

When British naturalist Philip Henry Gosse wrote *The Romance of Natural History* in 1861, he concluded with a chapter entitled "The Great Unknown," in which he summarized much of what

was known about sea-monsters up to that time. On 28 July 1845, four men were out on Romsdal Fjord, fishing:

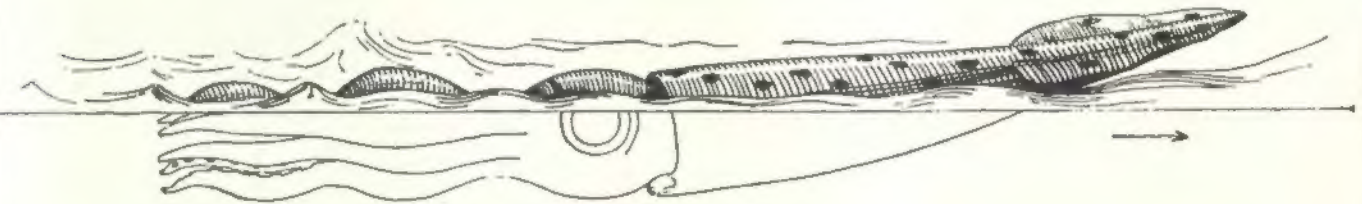
They saw a large marine animal, which slowly moved itself forward, as it appeared to them, with the help of two fins, on the fore part of its body near the head, which they judged from the boiling of the water on both sides of it. The visible part of the body appeared to be between forty and fifty feet in length, and moved in undulations like a snake. The body was round and of a dark colour, and seemed to be several ell [an ell equals two feet] in thickness. As they discerned a waving motion in the water behind the animal, they concluded that part of the body was concealed under water. That it was one connected animal they saw plainly from its movement. When the animal was about one hundred yards from the boat, they noticed tolerably correctly its fore-part, which ended in a sharp snout; its colossal head raised itself above the water in the form of a semicircle; the lower part was not visible.

kjaempeblaeksprutten. Particularly significant are the "waving motion" behind the animal (the arms), the "head" (a tentacular club), and the absence of eyes. (Ninety-nine years later, in Vike Bay in the very same Romsdal Fjord, a giant squid measuring 30 feet in total length was found by fishermen. One cannot fault those who believed that the 1845 animal was a sea serpent; how could they know that a real animal fitting that description would eventually appear?)

In 1905, two British naturalists, E.G.B. Meade-Waldo and M.J. Nicoll, on a scientific cruise aboard the Earl of Crawford's steam auxiliary yacht *Valhalla*, sighted a dark brown animal with a great frill on its back off the coast of Brazil. In the *Proceedings of the Zoological Society of London*, Meade-Waldo published his observations:

I looked and saw a large fin or frill sticking out of the water, dark seaweed-brown in

tion of a giant squid swimming at the surface; the frill could be one of the tail fins; the neck (not attached to the "frill") one of the long tentacles, and the head its flattened end. The "turtle-like" appearance of the eye is admittedly a problem, but if something looks like the "head" of an animal, we expect to see an eye *somewhere*, and Meade-Waldo and Nicoll may have only imagined it. (There have been many "sea-monster" sightings that can be explained as *Architeuthis* if we assume that the observers misidentified the eye). As for the "peculiar" movement of the head (which Nicoll described as "a curious wriggling movement"), it is more likely that they were describing an object that was *not* a head, but something else—a tentacle, perhaps. We know virtually nothing about the locomotion of giant squid at the surface (if indeed they ever locomote at the surface), but it is possible that these creatures swim with a tentacle out of the water, which would go a long way towards explaining the sightings of a large-bodied animal with a



In this diagram of a giant squid swimming at the surface, Henry Lee provided a possible explanation for the Daedalus sea monster. The tentacles have been omitted from the drawing, but they would have more than doubled the creature's length. (Lee, Sea Monsters Unmasked)

Gosse wrote, "Few seacoasts have been more sedulously searched, or by more acute naturalists...than those of Norway. Krakens and sea-serpents ought to have been living and dying thereabouts from long before Pontoppidan's time to our day, if all tales were true; yet they have never vouch-safed a single fragment of the skeleton to any Scandinavian collector." Eleven years later, when a Kraken "fragment"—consisting of an entire giant squid—appeared off Newfoundland, an explanation appeared and it became possible to interpret Gosse's story as a description of what the Norwegians now call

colour, somewhat crinkled on the edge. It was apparently about 6 feet in length and projected from 18 inches to 2 feet from the water. I could see, under the water to the rear of the frill, the shade of a considerable body. I got my field glasses on to it (a powerful pair of Goerz Trieder), and almost as soon as I had them on the frill, a great head and neck rose out of the water in front of the frill; the neck did not touch the frill in the water, but came out of the water in front of it, at a distance of not less than 18 inches, probably more. The neck appeared about the thickness of a slight man's body, and from 7 to 8 feet was out of the water. The head had a turtle-like appearance, as had also the eye. I could see the line of the mouth, but we were sailing pretty fast, and quickly drew away from the object, which was going very slowly. It moved its head from side to side in a peculiar manner; the colour of the head and neck was dark brown above, and whitish below—almost white, I think.

It is certainly possible to read this description as a monster with a "frill," but it is almost as easy to see it as a descrip-

tion of a long neck. (If a giant squid ever swam with both of its tentacles out of the water, we would probably have reports of two-headed monsters).

Most authors of sea-monster studies quote the tale of the Grace Line steamer *Santa Clara*, sailing from New York to Cartagena in 1947. Some 118 miles off North Carolina, the ship struck a marine creature. Third Officer John Axelsson saw

a snakelike head rear out of the sea about 30 feet off the starboard bow of the vessel. His exclamation of amazement directed the attention of the other two mates to the Sea Monster, and the three watched it unbelievably as in a moment's time it came abeam of the bridge where they stood and was left astern. The creature's head appeared to be about 2 1/2' across, 2' thick, and 5' long. The cylindrically shaped body was about 3' thick, and the neck 1 1/2' in diameter. The visible part of the body was about 35' long.

Since none of the descriptions include a mouth or eyes—features that would

probably attract immediate attention—it seems plausible to assign all the elements of the *Santa Clara* sighting to the giant squid. The “snakelike head” could be the club end of one of the long tentacles with the suckers turned away from the viewer, and the “neck” would be the tentacle itself. The given dimensions coincide with those of the club of a large squid’s tentacle, and even the “cylindrically shaped body” is the right size. In other words, there is nothing in this description that might not refer to *Architeuthis*.

The giant squid is not the explanation for every monster; there are many sightings by reputable persons that cannot be conveniently dumped into a basket woven of squid tentacles. Some monsters have been oarfish; others basking sharks, whales, or their deformed carcasses. There are some that simply cannot be

encompassed by any rational explanation. We now realize that there are gigantic creatures alive and well in the world’s oceans, but the giant squid remains the quintessential sea mystery. There have been about 150 records of specimens stranded on the beach or floating at the surface, but so far, nobody—at least nobody who knew what they were looking at—has seen a healthy giant squid. Because of the animal’s deep-water habitat and its presumed rarity, an expedition to film one in its native habitat is beyond the range of our technology, and even if it were possible, the cost would be prodigious. Where would we go? Once we got there, to what depth? And what would we use to entice the creature into camera range? A film of one (or more) of these 60-footers, propelling itself through the murky deep, remains among the sea’s last uncaptured images. ✱

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A side view of the elusive Architeuthis, showing the mouth between the arms, the huge eye, and below it the funnel with which it jets through the depths by expelling water. (U.S. Fish Commission, Report...for 1879)

